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The Ultra-Low Yield Antitank Weapon

The Teeny Tiny Tacnuke (U)

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UNITED STATES
DEPARTMENT OF ENERGY
CONTRACT W-7405-ENG. 36

THE ULTRA-LOW YIELD ANTITANK WEAPON
The Teeny Tiny Tacnuke (U)

by

Johndale C. Solem

ABSTRACT (CRD)

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The effect of such a device on tank crews is shown to be consistent with the P_k of unity for ballistic delivery systems. Estimates of collateral damage indicate that such a device could be used in close proximity to civilian populations with minimal hazard.

THE W79

The W79 is an 8-in., enhanced radiation, artillery fired atomic projectile. The device is in production and will enter the stockpile in the early 1980s. It is about 44 cm long and weighs about 200 lb complete with its arming, fusing, and firing system and its rocket assist. The range of the projectile when fired from an 8-in. howitzer is about 32 km.

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TACTICS

Should a European Theater conflict escalate to the nuclear level, the effect will be to force Soviet and Warsaw Pact armies to disperse formations of tanks to avoid having large numbers incapacitated by a single weapon. Denying an aggressor force the use of massed formations of armor is the single most important aspect of the W79.

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Whether a device with a lethal range as great as the W79 is an optimal weapon against massed formations of tanks is much debated; nevertheless, it remains a significant achievement of the technological community to get such an advanced device into the tactical stockpile.

The principal purpose of this report is to propose a complement to the W79 for the one-on-one engagements with tanks that will result from their forced dispersal.

THE ONE-ON-ONE ENGAGEMENT

A war with a technologically sophisticated enemy such as the Soviet Union will present extremely stressing countermeasures to high technology weapons systems. Although I have great faith that precision guided munitions of extraordinary accuracy and durability will be developed, the survival of such devices against countermeasures and in the severe environment of a nuclear war is certainly unproven. Almost any beam-riding weapon, using a laser or radar guidance system, is vulnerable to countermeasures and can reveal the position of the attacker. Devices employing low levels of artificial intelligence such as pattern recognition gadgetry are bound to suffer from smoke, dust, and chaff. Wire-guided and fiber-optic-guided munitions also suffer from countermeasures, mainly owing to their intrinsic lack of speed. It seems that for every new guidance system a new wrinkle can be discovered to defeat it. Furthermore, all devices using solid-state microcircuitry are vulnerable to electromagnetic pulses.

SIMPLICITY IS ELEGANCE

There is no countermeasure to a ballistic trajectory. What weapon is then appropriate to ballistic delivery at typical one-on-one engagement distances? Normally the target will be acquired at ranges of about 2 km. This will be purely visual contact. Normally, ballistic delivery miss distances do not exceed 7 1/2 *mils;* that is, 7 1/2 m at 1 km. The type of circular error probability varies with the type of ballistic delivery mechanism, and because a tank is generally a moving target, miss distances may be slightly enlarged. They are unlikely to exceed 25 m at 2 km, however. For the purpose of this discussion, we might consider the delivery vehicle to be a small rocket.

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ANALYTIC EFFECTS CALCULATIONS

Table I shows the radiation dose from neutrons and gamma rays as a function of distance from the point of detonation. Tank crews within 25 m of the weapon would be immediately incapacitated. Civilian populations 300 m from the point of detonation would be completely safe. Table II shows the expected thermal radiation from the same device. The thermal radiation would have no effect on the tank other than to singe its paint. Beyond 300 m, exposed personnel might be temporarily blinded from looking directly at the detonation, but would suffer no burns to exposed skin. Table III shows blast. The target tank would suffer little effect from blast at 25 m. The effect of blast on civilian structures near the battlefield would be trivial. Three hundred meters from the point of detonation windows would rattle but not break.

The most important aspect of collateral damage is local fallout. DELETED DOE 6.2 (a) Furthermore, with a surface burst or a burst in which soil became infused with the fission fragments, the fallout would be expected to be confined to the battlefield itself. In air bursts the fission fragments would be expected to rise with the fireball and be dispersed over a fairly large area. The principal advantage of such a device in reducing collateral damage from local fallout is that it simply does not produce much in the way of fission fragments or activated weapon debris.

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TABLE I

PROMPT NUCLEAR RADIATION DOSE FROM DELETED DOE 6.2 (a)

Distance (m)	
15	DELETED
25	
50	
100	
300	

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TABLE II

THERMAL EFFECTS FROM DELETED DOE 6.2 (a)

Distance (m)	Exposure (cal/cm^2)
15	
25	DELETED
50	
100	
300	

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TABLE III

BLAST EFFECTS FROM **DELETED** DOE 6.2 (a)

Distance (m)	Peak Overpressure (psi)	Peak Dynamic Pressure (psi)
15		
25		
50	DELETED	DOE 6.2 (a)
100		
300		

DELETED DOE 6.2 (a)

MONTE CARLO CALCULATION

To assess the accuracy of the analytic calculations given in the previous section a Monte Carlo calculation

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By any measure this corresponds to a P_k of unity.

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SAFETY AND SECURITY

Certain features of the design specifications of such a device have intrinsic advantages in the context of safety and security. Of course, arguments here must be made within the arena of rational and material consequences rather than the arena of political consequences.

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Let me elaborate on this rather radical statement.

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It is not a weapon of mass destruction. It is designed to be effective against tanks. These features do not provide the terrorist any great material advantage.

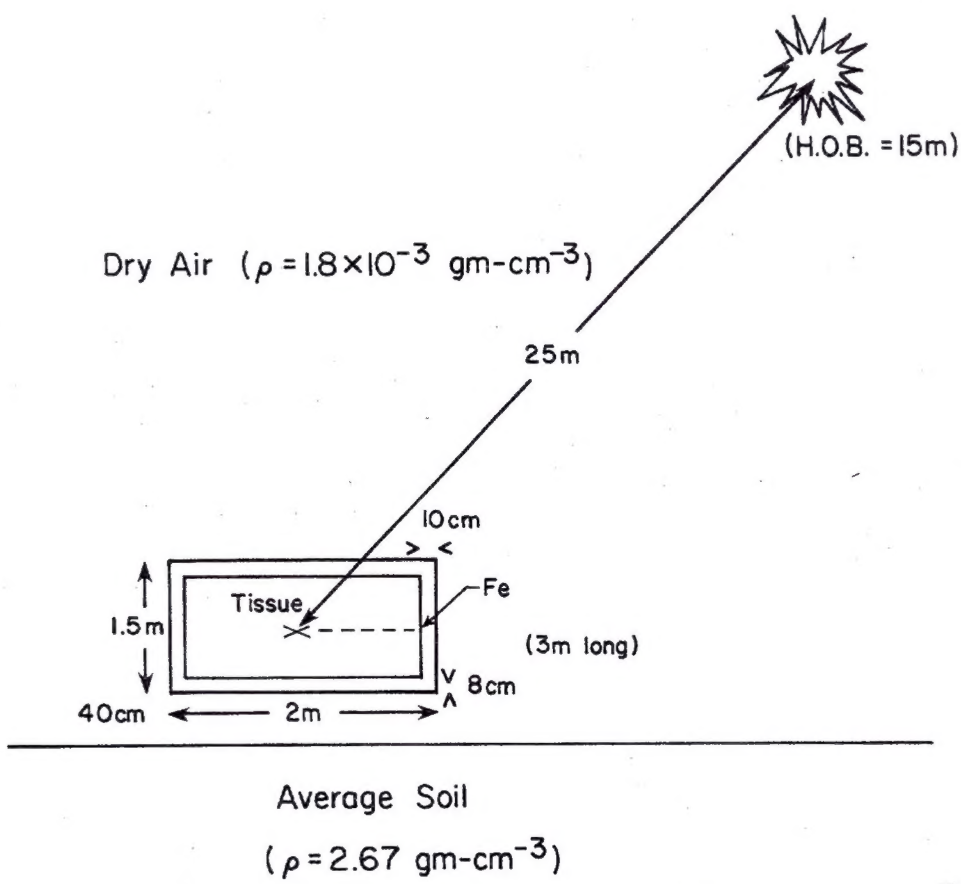

Fig. 3. Geometry of Monte Carlo calculation

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The terrorist is seeking increased fire power, which scales approximately with yield. DELETED

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In the present public perception, however, such a device might have an enormous political effect. The public should be educated.

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DELETED The same constraint would prohibit the use of plutonium and, therefore, would deny the terrorist access to toxic material he might use in other than a nuclear explosive context. In containing a small amount of material, such weapons would also deny the terrorist enough fissile material to build a weapon of larger yield. If bent on capturing fissile material, the terrorist would do better with other presently unsecured weapons.

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Perhaps the political climate that would allow the development of such a weapon would also allow a change in standards.

APPROACHES TO DEVELOPMENT OF SUCH A DEVICE

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CONCLUSIONS

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Whether such a device is truly feasible is a matter of careful technical scrutiny. I hope that this paper might provide sufficient impetus for its further exploration.

ACKNOWLEDGMENTS

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